

## CLAIMS

What is claimed is:

1. A method facilitating design and manufacturing processes, the method comprising  
5 receiving a plurality of article characteristic values associated with a set of articles having a range of variation as to a plurality of article characteristics;  
selecting a predictor characteristic from the plurality of article characteristics; and,  
determining the regression model(s) between the predictor characteristic and at least one of the remaining article characteristics in the plurality of article characteristics.  
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2. The method of claim 1 further comprising  
receiving a target value for the predictor characteristic and a target value for at least one remaining article characteristic;  
determining the intersection of the target value for the predictor characteristic and the  
15 target value of a first remaining article characteristic relative to the regression model between the predictor characteristic and the first remaining article characteristic.
3. The method of claim 1 further comprising  
determining the respective upper and lower prediction intervals associated with the  
20 regression model(s) between the predictor characteristic and at least one of the remaining article characteristics.
4. The method of claim 2 further comprising  
determining the respective upper and lower prediction intervals associated with the  
25 regression model(s) between the predictor characteristic and at least one of the remaining article characteristics.
5. The method of claim of 4 further comprising  
receiving lower and upper specification limits for the predictor characteristic and at least  
30 one of the remaining article characteristics;

locating the lower and upper specification limits associated with said at least one remaining article characteristic;

locating the upper and lower specification limits associated with the predictor characteristic.

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6. The method of claim 1 further comprising

receiving lower and upper specification limits for at least one of the remaining article characteristics;

locating the lower and upper specification limits associated with at least one remaining article characteristic relative to the regression model between the predictor characteristic and said at least one remaining article characteristic.

7. The method of claim 6 further comprising  
determining the value of the predictor characteristic at which the corresponding regression model intersects the upper specification limit for at least one remaining article characteristic.

8. The method of claim 6 or 7 further comprising  
determining the value of the predictor characteristic at which the corresponding regression model intersects the lower specification limit for at least one remaining article characteristic.

9. The method of claim 3 further comprising  
receiving lower and upper specification limits for at least one of the remaining article characteristics;

locating the specification limits associated with said at least one remaining article characteristic relative to the regression model between the predictor characteristic and said at least one remaining article characteristic.

30 10. The method of claim 9 further comprising

determining the value of the predictor characteristic at which the upper prediction interval associated with the regression model between the predictor characteristic and said at least one remaining article characteristic intersects the upper specification limit for said at least one remaining article characteristic.

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11. The method of claim 9 or 10 further comprising

determining the value of the predictor characteristic at which the lower prediction interval associated with the regression model between the predictor characteristic and said at least one remaining article characteristic intersects the lower specification limit for said at least 10 one remaining article characteristic.

12. The method of claim 6 further comprising

receiving the lower and upper specification limits for the predictor characteristic; and  
locating the upper and lower specification limits associated with the predictor  
15 characteristic.

13. The method of claim 8 further comprising

receiving the lower and upper specification limits for the predictor characteristic; and  
locating the upper and lower specification limits associated with the predictor  
20 characteristic.

14. The method of claim 3 further comprising

receiving lower and upper specification limits for said at least one of the remaining  
article characteristics;  
25 locating the lower and upper specification limits associated with said at least one of the  
remaining article characteristics;  
receiving lower and upper specification limits for the predictor characteristic;  
locating the upper specification limit associated with the predictor characteristic; and  
determining a maximum article characteristic value for the predictor characteristic by  
30 selecting the lesser of (1) the upper specification limit for the predictor characteristic and (2) the

value of the predictor characteristic at which the upper prediction interval intersects the upper specification limit for said at least one remaining article characteristic.

15. The method of claim 14 further comprising

- 5       repeating the determining a maximum article characteristic value step for a desired number of remaining article characteristics in the plurality of article characteristics; and  
      determining the most constraining maximum article characteristic value for the predictor characteristic by selecting the lowest maximum article characteristic value.

10 16. The method of claim 14 further comprising

      receiving lower and upper specification limits for at least one of the remaining article characteristics;

      locating the lower specification limit associated with the predictor characteristic; and  
      determining a minimum article characteristic value for the predictor characteristic by

- 15 selecting the greater of (1) the lower specification limit for the predictor characteristic and (2) the value of the predictor characteristic at which the lower prediction interval intersects the lower specification limit for said at least one remaining article characteristic.

17. The method of claim 16 further comprising

- 20       determining an allowable range for the predictor characteristic subtracting the minimum article characteristic value from the maximum characteristic value.

18. The method of claim 16 further comprising

- repeating the determining a minimum article characteristic value step for a desired  
25 number remaining article characteristics in the plurality of article characteristics; and  
      determining the most constraining minimum article characteristic value for the predictor characteristic by selecting the greatest minimum article characteristic value.

19. The method of claim 18 further comprising

determining the maximum allowable range for the predictor characteristic by subtracting the most constraining minimum article characteristic value from the most constraining maximum characteristic value.

5 20. The method of claim 19 further comprising

determining the target manufacturing value for the predictor characteristic by selecting a value between the most constraining minimum and maximum article characteristic values for the predictor characteristic.

10 21. The method of claim 19 further comprising

determining the target manufacturing value for the predictor characteristic by selecting the midpoint value between the most constraining minimum and maximum values for the predictor characteristic.

15 22. The method of claim 21 further comprising

receiving a target value for the predictor characteristic and a target value for at least one remaining article characteristic;

determining the intersection of the target value for the predictor characteristic and the target value of a first remaining article characteristic relative to the regression model between  
20 the predictor characteristic and the first remaining article characteristic.

23. The method of claim 1 wherein the selecting step comprises

selecting the predictor characteristic based at least in part on an assessment of the capability of each article characteristic to be predictive of all or a subset of the article  
25 characteristics in the plurality of article characteristics.

24. The method of claim 23 wherein the selecting step comprises

calculating the correlation coefficients between all or a subset of the article characteristics;  
30 determining, based on the calculated correlation coefficients, a value indicating the predictive capability of a first article characteristic relative to all other article characteristics;

repeating the determining step for said all or a subset of the article characteristics; and  
selecting a predictor characteristic based at least in part on the values indicating the  
predictive capabilities of the article characteristics.

5 25. The method of claim 24 wherein the predictor characteristic is selected as the article  
characteristic associated with the value indicating the highest predictive capability.

26. The method of claim 24 further comprising  
ranking the article characteristics based on the values computed in the determining step.

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27. The method of claim 24 wherein the determining step comprises  
calculating the average correlation coefficient for each article characteristic.

28. The method of claim 24 wherein the determining step comprises

15 calculating the average of the absolute values of the correlation coefficients for each  
article characteristic.

29. The method of claim 23 wherein the predictor characteristic is selected based on a graphical  
determination of the article characteristic having the greatest predictive capabilities.

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30. The method of claim 23 wherein selection of the predictor characteristic is further based on  
factors associated with assessing each article characteristic.

31. The method of claim 30 wherein the factors comprise the economic factors associated with  
25 assessing each article characteristic.

32. The method of claim 30 wherein the factors comprise the technical factors associated with  
assessing each article characteristic.

30 33. The method of claim 28 further comprising

ranking the article characteristics based on the values computed in the determining step;  
and

wherein selection of the predictor characteristic is further based on economic or technical factors associated with assessing each article characteristic.

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34. A method facilitating design and manufacturing processes, the method comprising receiving a plurality of article characteristic values associated with a set of articles having a range of variation as to a plurality of article characteristics; determining the regression model(s) between a first article characteristic and at least one remaining article characteristic in  
10 the plurality of article characteristics;

receiving a target value for the first article characteristic and a target value for said at least one of the remaining article characteristic; and

determining the intersection between the target value for the first article characteristic and a target value for said at least one remaining article characteristic.

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35. The method of claim 34 wherein regression models are determined for all possible combinations of article characteristics in the plurality of article characteristics.

36. The method of claim 34 wherein regression models are determined for a subset of all  
20 possible combinations of article characteristics in the plurality of article characteristics.

37. The method of claim 34, 35 or 36 further comprising displaying the regression model(s) on a user interface display.

25 38. The method of claim 37 wherein the regression model(s) are graphically displayed in scatter diagrams on the user interface display.

39. The method of claim 34 further comprising receiving the lower and upper specification limits for said at least one remaining article  
30 characteristics;

locating the specification limits associated with said at least one remaining article characteristic.

40. The method of claim 39 further comprising

- 5 receiving the lower and upper specification limits for the first article characteristic;  
locating the lower and upper specification limits for the first article characteristic.

41. The method of claim 39 further comprising

- (a) determining the value of the first article characteristic at which the regression model  
10 intersects the upper specification limit for said at least one remaining article characteristic.

42. The method of claim 39 or 41 further comprising

determining the value of the first article characteristic at which the regression model intersects the lower specification limit for said at least one remaining article characteristic.

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43. The method of claim 41 further comprising

repeating the determining step (a) for a desired number of remaining article characteristics; and

- determining the most constraining maximum value for the first article characteristic by  
20 selecting the lowest value of the first article characteristic associated with the determining step  
(a).

44. The method of claim 43 further comprising

- (b) determining the value of the first article characteristic at which the regression model  
25 intersects the lower specification limit for said at least one remaining article characteristic;  
repeating the determining step for a desired number of remaining article characteristics;  
and

determining the most constraining minimum value for the first article characteristic by  
selecting the greatest value of the first article characteristic associated with the determining  
30 step (b).



45. The method of claim 44 further comprising

determining the target manufacturing value for the first characteristic by selecting the midpoint between the most constraining minimum and maximum values for the first article characteristic.

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46. The method of 44 further comprising

determining the maximum allowable range for the first article characteristic by subtracting the most constraining minimum value for the first article characteristic from the most constraining maximum value for the first article characteristic.

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47. The method of claim 44 further comprising

determining the target manufacturing value for the first characteristic by selecting a value between the most constraining minimum and maximum values for the first article characteristic.

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48. The method of claim 41 further comprising

receiving the lower and upper specification limits for the first article characteristic; and  
locating the lower and upper specification limits associated with the first article characteristic;

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repeating the determining step (a) for a desired number of remaining article characteristics; and

determining the most constraining maximum value for the first article characteristic by selecting the lower of (1) the upper specification limit for the first article characteristic and (2) the lowest value computed in the determining step (a).

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49. The method of claim 47 further comprising

(b) determining the value of the first article characteristic at which the regression model intersects the lower specification limit for said at least one remaining article characteristic;  
repeating the determining step (b) for a desired number of remaining article  
30 characteristics; and

determining the most constraining minimum value for the first article characteristic by selecting the greater of (1) the lower specification limit for the first article characteristic and (2) the greatest value of the first article characteristic computed in the determining step (b).

5 50. A method facilitating design and manufacturing processes, the method comprising  
receiving a plurality of article characteristic values associated with a set of articles having  
a range of variation as to a plurality of article characteristics; determining a first regression  
model between a first article characteristic and a second article characteristic;  
determining at least a second regression model between the first article characteristic  
10 and at least one of the remaining article characteristics; and,  
facilitating a comparison between the regression models.

51. The method of claim 50 wherein regression models are determined for all possible  
combinations of article characteristics in the plurality of article characteristics.

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52. The method of claim 50 wherein regression models are determined for a subset of all  
possible combinations of article characteristics in the plurality of article characteristics.

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53. The method of claim 50, 51, or 52 further comprising  
displaying the regression model(s) on a user interface display.

54. The method of claim 53 wherein the regression models are graphically displayed in scatter  
diagrams on the user interface display.

25 55. The method of claim 50 further comprising  
receiving a target value as to at least two article characteristics;  
as to a first article characteristic and a second article characteristic, locating the  
intersection of the target values of the first and second article characteristics relative to the  
regression model associated with the first and second article characteristics.

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56. The method of claim 55 further comprising

As to the first article characteristic and a third article characteristic, locating the intersection of the target values of the first and third article characteristics relative to the regression model associated with the first and third article characteristics.

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57. The method of claim 50 further comprising

receiving the lower and upper specification limits for the second article characteristic and a third article characteristic;

locating the specification limits associated with the second article characteristic relative  
10 to the regression model between the first article characteristic and the second article characteristic;

locating the specification limits associated with the third article characteristic relative to the regression model between the third article characteristic and the first article characteristic.

15 58. The method of claim 56 further comprising

receiving the lower and upper specification limits for the first article characteristic;

locating the specification limits for the first article characteristic relative to the regression model between the first article characteristic and the second article characteristic;  
and

20 locating the specification limits for the first article characteristic relative to the regression model between the first article characteristic and the third article characteristic.

59. A method facilitating design and manufacturing processes associated with the production of an article, the article having a plurality of article characteristics, at least two of the article  
25 characteristics having a target value and upper and lower specification limits, the method comprising

generating a set of articles having a range of variation as to a plurality of article characteristics;

30 assessing the set of articles as to all or a subset of the plurality of article characteristics;  
selecting a predictor characteristic from the plurality of article characteristics; and,

determining the regression model(s) between the predictor characteristic and at least one of the remaining article characteristics in the plurality of article characteristics.

60. The method of claim 59 further comprising

5 determining the intersection of the target value for the predictor characteristic and the target value of at least one remaining article characteristic relative to the regression model between the predictor characteristic and said at least one remaining article characteristic.

61. The method of claim 59 further comprising

10 determining the respective upper and lower prediction intervals associated with the regression model between the predictor characteristic and said at least one of the remaining article characteristics.

62. The method of claim 60 further comprising

15 determining the respective upper and lower prediction intervals associated with the regression model(s) between the predictor characteristic and said at least one of the remaining article characteristics.

63. The method of claim of 62 further comprising

20 locating the lower and upper specification limits associated with said at least one remaining article characteristic;

locating the upper and lower specification limits associated with the predictor characteristic.

25 64. The method of claim 59 further comprising

locating the specification limits associated with said at least one remaining article characteristic.

65. The method of claim 64 further comprising

30 determining the value of the predictor characteristic at which the regression model intersects the upper specification limit for said at least one remaining article characteristic.

66. The method of claim 64 or 65 further comprising  
determining the value of the predictor characteristic at which the regression model  
intersects the lower specification limit for said at least one remaining article characteristic.

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67. The method of claim 61 further comprising  
locating the specification limits associated with said at least one remaining article  
characteristic.

10 68. The method of claim 67 further comprising

determining the value of the predictor characteristic at which the upper prediction  
interval associated with the regression model between the predictor characteristic and said at  
least one remaining article characteristic intersects the upper specification limit for said at least  
one remaining article characteristic.

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69. The method of claim 67 or 68 further comprising

determining the value of the predictor characteristic at which the lower prediction  
interval associated with the regression model between the predictor characteristic and said at  
least one remaining article characteristic intersects the lower specification limit for said at least  
20 one remaining article characteristic.

70. The method of claim 64 further comprising

locating the upper and lower specification limits associated with the predictor  
characteristic.

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71. The method of claim 66 further comprising

locating the upper and lower specification limits associated with the predictor  
characteristic.

30 72. The method of claim 61 further comprising

locating the lower and upper specification limits associated with said at least one remaining article characteristic.

locating the upper specification limit associated with the predictor characteristic; and  
determining a maximum article characteristic value for the predictor characteristic by  
5 selecting the lesser of (1) the upper specification limit for the predictor characteristic and (2) the  
value of the predictor characteristic at which the upper prediction interval intersects the upper  
specification limit for said at least one remaining article characteristic.

73. The method of claim 72 further comprising

10 repeating the determining a maximum article characteristic value step for a desired  
number of remaining article characteristics in the plurality of article characteristics; and  
determining the most constraining maximum article characteristic value for the  
predictor characteristic by selecting the lowest maximum article characteristic value.

15 74. The method of claim 72 further comprising

locating the lower specification limit associated with the predictor characteristic; and  
determining a minimum article characteristic value for the predictor characteristic by  
selecting the greater of (1) the lower specification limit for the predictor characteristic and (2)  
the value of the predictor characteristic at which the lower prediction interval intersects the  
20 lower specification limit for said at least one remaining article characteristic.

75. The method of claim 74 further comprising

determining an allowable range for the predictor characteristic by subtracting the  
minimum article characteristic value from the maximum characteristic value.

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76. The method of claim 74 further comprising

repeating the determining a minimum article characteristic value step for a desired  
number of remaining article characteristics; and  
determining the most constraining minimum article characteristic value for the predictor  
30 characteristic by selecting the greatest minimum article characteristic value.

77. The method of claim 76 further comprising  
determining the maximum allowable range for the predictor characteristic by  
subtracting the most constraining minimum article characteristic value from the most  
constraining maximum characteristic value.

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78. The method of claim 76 further comprising  
determining the target manufacturing value for the predictor characteristic by selecting a  
value between the most constraining minimum and maximum values for the predictor  
characteristic.

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79. The method of claim 76 further comprising  
determining the target manufacturing value for the predictor characteristic by selecting  
the midpoint value between the most constraining minimum and maximum values for the  
predictor characteristic.

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80. The method of claim 79 determining the intersection of the target value for the predictor  
characteristic and the target value of at least one remaining article characteristic relative to the  
regression model between the predictor characteristic and said at least one remaining article  
characteristic.

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81. The method of claim 59 wherein the selecting step comprises  
selecting the predictor characteristic based at least in part on an assessment of the  
capabilities of each article characteristic to be predictive of the other article characteristics in  
the plurality of article characteristics.

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82. The method of claim 81 wherein the selecting step comprises  
calculating the correlation coefficients between all or a subset of the article  
characteristics;  
determining, based on the calculated correlation coefficients, a value indicating the  
30 predictive capability of a first article characteristic relative to all other article characteristics;  
repeating the determining step for all article characteristics; and

selecting a predictor characteristic based at least in part on the values indicating the predictive capabilities of the article characteristics.

83. The method of claim 82 wherein the predictor characteristic is selected as the article  
5 characteristic associated with the value indicating the highest predictive capability.

84. The method of claim 82 further comprising  
ranking the article characteristics based on the values computed in the determining step.

10 85. The method of claim 82 wherein the determining step comprises  
calculating the average correlation coefficient for each article characteristic.

86. The method of claim 82 wherein the determining step comprises  
calculating the average of the absolute values of the correlation coefficients for each  
15 article characteristic.

87. The method of claim 81 wherein the predictor characteristic is selected based on a graphical  
determination of the article characteristic having the greatest predictive capabilities.

20 88. The method of claim 81 wherein the selection of the predictor characteristic is further based  
on factors associated with assessing each article characteristic.

89. The method of claim 88 wherein the factors comprise the economic factors associated with  
assessing each article characteristic.

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90. The method of claim 88 wherein the factors comprise the technical factors associated with  
assessing each article characteristic.

91. A method facilitating design and manufacturing processes, the method comprising  
30 generating a set of articles having a range of variation as to a plurality of article  
characteristics;



assessing the degree of correlation between the article characteristics; and,  
selecting a predictor characteristic from the plurality of article characteristics based on  
the assessing step.

- 5 92. The method of claim 91 further comprising  
determining a maximum allowable range for the predictor characteristic; and,  
subsequent to the determining step, verifying that subsequently generated articles  
comply with at least one design specification associated with said articles based on assessment  
of the predictor characteristic.

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